

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
540 S. MORRIS AVE., MONTGOMERY, AL 36115
PU ANALYSES**

REPORT OF SAMPLE DELIVERY GROUP #1000029

Project: Smokey Mountain Smelter, Knoxville, TN
Analysis Procedure: Actinides (Plutonium) by Extraction Chromatography
Report ID: 1000029-PU
Report Type: Original
Date Reported: 11/09/2010
Total Pages in Report: 19

SAMPLES

NAREL Sample #	Client Sample ID	Type	Matrix	Date Collected	Date Received
B0.07995U	03377 5-7 CM	SAM	SOIL	09/09/2010	09/17/2010
B0.07996V	03378 5-7 CM	SAM	SOIL	09/09/2010	09/17/2010
B0.07997W	03379 5-7 CM	SAM	SOIL	09/09/2010	09/17/2010
B0.07998X	03380 5-7 CM	SAM	SOIL	09/09/2010	09/17/2010
B0.07999Y	03381 5-7 CM	SAM	SOIL	09/09/2010	09/17/2010
B0.08000U	03045 5-7 CM	SAM	SOIL	09/09/2010	09/17/2010
B0.08001V	03046 5-7 CM	SAM	SOIL	09/09/2010	09/17/2010
B0.08002W	03047 5-7 CM	SAM	SOIL	09/09/2010	09/17/2010

EXCEPTIONS

1. Packaging and Shipping - No problems were observed.
2. Documentation - No problems were observed.
3. Sample Preparation - No problems were encountered.
4. Analysis - No problems were encountered.
5. Holding Times - All holding times were met.

QUALITY CONTROL

1. QC samples - All QC analysis results met NAREL acceptance criteria.
2. Yields - All chemical yields were within acceptance limits.
3. Instruments - Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.



CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Director of the Center for Environmental Radioanalytical Laboratory Science and the NAREL Quality Assurance Manager, or their designees, as verified by the following signatures.

Mary Wisdom 11-12-10
Mary F. Wisdom Date
Quality Assurance Manager, NAREL

John G. Griggs 11/18/10
John G. Griggs, Ph.D. Date
Director, Center for Environmental Radioanalytical
Laboratory Science

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Method blank

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

EVALUATION OF QC ANALYSES

A method blank result is considered unacceptable if it is more than 3 standard deviations below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "Z scores." A Z score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The Z score for a spiked sample is computed by dividing the difference between the measured value and the target value by the combined standard uncertainty of the difference.

The Z score for a duplicate analysis is computed by dividing the difference between the two measured values by the combined standard uncertainty of the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measured value and the net concentrations are then converted to total activities before the Z score is computed.

Each standard uncertainty used to compute a Z score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of reagent blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

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SDG #1000029

ANALYSIS SUMMARY

Analysis Procedure: NAREL PU-EICHROM
Title: Actinides (Plutonium) by Extraction Chromatography

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Assay Batch #	QC Batch #
B0.07995U		N/A	11/04/2010	0014535B	0007099A
B0.07996V		N/A	11/04/2010	0014535B	0007099A
B0.07997W		N/A	11/04/2010	0014535B	0007099A
B0.07998X		N/A	11/04/2010	0014535B	0007099A
B0.07999Y		N/A	11/04/2010	0014535B	0007099A
B0.08000U		N/A	11/05/2010	0014542A	0007099A
B0.08001V		N/A	11/05/2010	0014542A	0007099A
B0.08002W		N/A	11/05/2010	0014542A	0007099A
B0.08002W	DUP	N/A	11/05/2010	0014542A	0007099A
LCS-00594039Q *	LCS	N/A	11/05/2010	0014542A	0007099A
RBK-00594038P *	RBK	N/A	11/04/2010	0014535B	0007099A

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

PREPARATION METHOD(S) USED

Procedure ID	Title

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SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	B0.07995U	QC batch #:	0007099A
Matrix:	SOIL	Assay batch #:	0014535B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.568e-01 GASH	Analysis procedure:	NAREL PU-EICHROM
Dry/wet weight:	81.83 %	Analyst:	PMT
Ash/dry weight:	94.79 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/03/2010 14:58	1000.0	AS121	DPG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Pu238	-7.27e-03	2.5e-02	7.1e-02	PCI/GDRY	11/03/2010
Pu239	2.18e-02	3.9e-02	4.7e-02	PCI/GDRY	11/03/2010

**U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	B0.07996V	QC batch #:	0007099A
Matrix:	SOIL	Assay batch #:	0014535B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.554e-01 GASH	Analysis procedure:	NAREL PU-EICHROM
Dry/wet weight:	87.60 %	Analyst:	PMT
Ash/dry weight:	91.54 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/03/2010 14:58	1000.0	AS122	DPG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Pu238	8.59e-02	6.8e-02	6.4e-02	PCI/GDRY	11/03/2010
Pu239	3.36e-02	4.5e-02	4.8e-02	PCI/GDRY	11/03/2010

**U.S.ENVIRONMENTAL PROTECTION AGENCY
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SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	B0.07997W	QC batch #:	0007099A
Matrix:	SOIL	Assay batch #:	0014535B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.513e-01 GASH	Analysis procedure:	NAREL PU-EICHROM
Dry/wet weight:	87.60 %	Analyst:	PMT
Ash/dry weight:	95.88 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/03/2010 14:58	1000.0	AS123	DPG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Pu238	-2.14e-02	4.5e-02	1.2e-01	PCI/GDRY	11/03/2010
Pu239	2.14e-02	4.6e-02	7.4e-02	PCI/GDRY	11/03/2010

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SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	B0.07998X	QC batch #:	0007099A
Matrix:	SOIL	Assay batch #:	0014535B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.551e-01 GASH	Analysis procedure:	NAREL PU-EICHROM
Dry/wet weight:	87.98 %	Analyst:	PMT
Ash/dry weight:	91.93 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/03/2010 14:58	1000.0	AS124	DPG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Pu238	0.00e+00	2.2e-02	4.5e-02	PCI/GDRY	11/03/2010
Pu239	6.97e-03	3.1e-02	6.0e-02	PCI/GDRY	11/03/2010

**U.S.ENVIRONMENTAL PROTECTION AGENCY
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SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	B0.07999Y	QC batch #:	0007099A
Matrix:	SOIL	Assay batch #:	0014535B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.511e-01 GASH	Analysis procedure:	NAREL PU-EICHROM
Dry/wet weight:	79.17 %	Analyst:	PMT
Ash/dry weight:	84.96 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/03/2010 14:58	1000.0	AS126	DPG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Pu238	-7.23e-03	2.5e-02	7.1e-02	PCI/GDRY	11/03/2010
Pu239	1.08e-02	3.2e-02	4.7e-02	PCI/GDRY	11/03/2010

**U.S.ENVIRONMENTAL PROTECTION AGENCY
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SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	B0.08000U	QC batch #:	0007099A
Matrix:	SOIL	Assay batch #:	0014542A
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.581e-01 GASH	Analysis procedure:	NAREL PU-EICHROM
Dry/wet weight:	77.42 %	Analyst:	PMT
Ash/dry weight:	87.80 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/04/2010 12:33	1000.0	AS121	DPG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Pu238	3.84e-03	3.5e-02	7.5e-02	PCI/GDRY	11/04/2010
Pu239	1.15e-02	3.3e-02	5.0e-02	PCI/GDRY	11/04/2010

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SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	B0.08001V	QC batch #:	0007099A
Matrix:	SOIL	Assay batch #:	0014542A
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.509e-01 GASH	Analysis procedure:	NAREL PU-EICHROM
Dry/wet weight:	79.44 %	Analyst:	PMT
Ash/dry weight:	84.28 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/04/2010 12:33	1000.0	AS122	DPG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Pu238	8.28e-03	3.7e-02	7.1e-02	PCI/GDRY	11/04/2010
Pu239	0.00e+00	2.6e-02	5.4e-02	PCI/GDRY	11/04/2010

**U.S.ENVIRONMENTAL PROTECTION AGENCY
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SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	B0.08002W	QC batch #:	0007099A
Matrix:	SOIL	Assay batch #:	0014542A
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.541e-01 GASH	Analysis procedure:	NAREL PU-EICHROM
Dry/wet weight:	79.50 %	Analyst:	PMT
Ash/dry weight:	93.27 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/04/2010 12:33	1000.0	AS123	DPG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Pu238	3.87e-02	6.6e-02	1.1e-01	PCI/GDRY	11/04/2010
Pu239	7.74e-03	3.5e-02	6.6e-02	PCI/GDRY	11/04/2010

**U.S.ENVIRONMENTAL PROTECTION AGENCY
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SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	B0.08002W	QC batch #:	0007099A
Matrix:	SOIL	Assay batch #:	0014542A
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.575e-01 GASH	Analysis procedure:	NAREL PU-EICHROM
Dry/wet weight:	79.50 %	Analyst:	PMT
Ash/dry weight:	93.27 %	QC type:	DUP
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/04/2010 12:33	1000.0	AS124	DPG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Pu238	0.00e+00	2.5e-02	5.2e-02	PCI/GDRY	11/04/2010
Pu239	-4.00e-03	2.7e-02	6.9e-02	PCI/GDRY	11/04/2010

**U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	LCS-00594039Q	QC batch #:	0007099A
Matrix:	N/A	Assay batch #:	0014542A
Sample type:	N/A	Prep procedure:	N/A
Amount analyzed:	1.000e+00 SAMP	Analysis procedure:	NAREL PU-EICHROM
Dry/wet weight:	N/A	Analyst:	PMT
Ash/dry weight:	N/A	QC type:	LCS
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/04/2010 12:33	1000.0	AS126	DPG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Pu238	9.81e-04	9.0e-03	1.9e-02	PCI	11/04/2010
Pu239	2.31e+00	2.4e-01	1.3e-02	PCI	11/04/2010

**U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	RBK-00594038P	QC batch #:	0007099A
Matrix:	N/A	Assay batch #:	0014535B
Sample type:	N/A	Prep procedure:	N/A
Amount analyzed:	1.000e+00 SAMP	Analysis procedure:	NAREL PU-EICHROM
Dry/wet weight:	N/A	Analyst:	PMT
Ash/dry weight:	N/A	QC type:	RBK
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
11/03/2010 14:58	1000.0	AS127	DPG

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Pu238	0.00e+00	9.9e-03	2.3e-02	PCI	11/03/2010
Pu239	3.15e-03	9.2e-03	1.4e-02	PCI	11/03/2010

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG 1000029

QC BATCH SUMMARY

QC batch #: 0007099A
Preparation procedure: N/A
Analysis procedure: NAREL PU-EICHROM

NAREL Sample #	QC Type	Yield (%)	$\pm 2 \sigma$ Uncertainty (%)	Analyst
B0.07995U		95.46 %	7.74 %	PMT
B0.07996V		88.24 %	7.31 %	PMT
B0.07997W		82.11 %	7.01 %	PMT
B0.07998X		99.17 %	7.99 %	PMT
B0.07999Y		88.74 %	7.43 %	PMT
B0.08000U		83.37 %	7.14 %	PMT
B0.08001V		74.62 %	6.62 %	PMT
B0.08002W		87.50 %	7.28 %	PMT
B0.08002W	DUP	86.95 %	7.38 %	PMT
LCS-00594039Q *	LCS	96.62 %	7.82 %	PMT
RBK-00594038P *	RBK	89.20 %	7.42 %	PMT

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

**National Air and Radiation Environmental Laboratory
QC Batch Report**

QC Batch #: 0007099A

Analytical Procedure: NAREL PU-EICHROM

METHOD BLANKS (PCI)

Sample ID	Nuclide	Activity $\pm 2\sigma$	Prep Date	Flags
00594038P	PU238	$0.00e+00 \pm 9.9e-03$	2010-10-26	OK
00594038P	PU239	$3.15e-03 \pm 9.2e-03$	2010-10-26	OK

LABORATORY DUPLICATES (PCI/GASH)

Sample ID	Nuclide	Original $\pm 2\sigma$	Duplicate $\pm 2\sigma$	RPD	Z
B0.08002W	PU238	$4.15e-02 \pm 7.0e-02$	$0.00e+00 \pm 2.7e-02$	200.00	-1.10 OK
B0.08002W	PU239	$8.29e-03 \pm 3.7e-02$	$-4.29e-03 \pm 2.8e-02$	627.71	-0.54 OK

LAB CONTROL SAMPLES (PCI)

Sample ID	Nuclide	Amt Added $\pm 2\sigma$	Measured $\pm 2\sigma$	%R	Z
00594039Q	PU238	NO SPIKE DATA			
00594039Q	PU239	$2.14e+00 \pm 2.2\%$	$2.31e+00 \pm 2.4e-01$	107.98	1.40 OK

Analyst:

Paula Thaxton
Thaxton, Paula M.

11/5/10

QA Officer:

Kimberly M. Egan

11/8/10

Method Blanks

Analyte: PU238

Method: NAREL PU-EICHROM

Analyst: Thaxton, Paula M.



Method Blanks

Analyte: PU239

Method: NAREL PU-EICHROM

Analyst: Thaxton, Paula M.

